Name: Rachel Fischhoff Grade: 5 Date: March 19, 2012

STRING + SHAPE EQUATIONS

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| Lesson Sources: Minilessons for Extending Multiplication and Division: A Yearlong Resource, Catherine Twomey Fosno and Willem Uittenbogaard  Groundworks: Alebraic Thinking 5, Greenes and Findell |
| Lesson Objectives: Students will be able to find the values of shape-variables using their knowledge of variables and equivalence. |
| Standards: M(F&A)–5–3 **Demonstrates conceptual understanding of algebraic expressions** by using letters to represent unknown quantities to write linear algebraicexpressions involving any two of the four operations; or by evaluating linear algebraicexpressions using whole numbers. (State)  M(F&A)–5–4 **Demonstrates conceptual understanding of equality** by showing equivalence between two expressions using models or different representations of the expressions (expressions consistent with the parameters of M(F&A)–5–3), by solving one-step linear equations of the form *ax* = *c*, *x* ± *b* = *c*, or *x*/*a* = *c*, where *a*, *b*, and *c* are whole numbers with *a* ≠ 0; or by determining which values of a replacement set make the equation (multi-stepof the form *ax* ± *b* = *c* where *a*, *b*, and *c* are whole numbers with *a* ≠ 0)a true statement(e.g., 2*x* + 3 = 11, {*x*: *x* = 2, 3, 4, 5}). (State) |
| Multicultural Content: review vocab: variable, equivalence//review strategy: double number line |
| Materials and Advanced Preparation: SmartBoard, copies of Groundworks packet |
| Prior Knowledge and Skills Needed: division skills, double number line skills, understanding of a variable—as a representation of a specific, unchanging numerical value |
| Key/New Vocabulary: Equivalence, variable |

Lesson Procedure: Part One

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| **Time** | **Teacher Actions** | **Student Learning Activities** | **Form of Assessment** |
| 1 min | **0. Warm Up**   * Mathematicians, today we are going to warm up with a math string and represent our thinking using a double number line. We have used double number lines a lot to show equivalence and to show our thinking for multiplication problems. Today we are going to extend that work by using a double number line to represent our thinking in division. * 36/6   72/6  72/12  144/24  42/6  126/18  425/25  (during this string, I’ll draw the respresentations on the SmartBoard. If it seems helpful, a student may draw one or two.) | * Active listening * Following along on board * Thumb on knee participation * Option for T&T in the string | * Thumbs * Some answers * Explanations of thinking |
| 1 min | **1. Connection**   * Today we are going to work on another packet of problems to stretch our algebraic thinking. After the frog-jumping assessment, we had a discussion about variables and today we are going to dig into variables even more—what are they? How do they work? How can I find out how much a variable represents? | Explain purpose of mini-lesson | Active listening |
| 10 min max | **2. The Teaching (The Giving of Information):**   * We have talked earlier about the idea that a variable can take many forms. It could be a letter—like j or x—it could be a symbol—like a star or a smiley face—or it could be a shape. Today we are going to be looking at shape variables. * What all variables have in common is that they represent a numerical value *and* there value does not change within one problem. * Take a look at these shape equations on the board. Notice that all of the triangles will be worth the same value. Each square will also have the same value. * How many shapes are in the first equation? (2) * If Square is 3 and Triangle is 4, is the first equation true? (Yes). Is the second equation true? (No). * What other sets of values make the first equation true? Thumb on your knee if you have an idea. (Get a variety of options) | * Active listening * Responding to questions | * Selected responses * Thumb responses |
|  | **3. Have-A-Go (optional)**   * We have lots of possible values for triangle and square that make the first equation true. Turn and talk to a partner about which pair of values works in the first *and* second values. * Take responses—How did you figure it out? (Record on slide) | How will students be actively involved?  By:   * Partner Talk | * Listen in to T&Ts * Facilitate conversation after share out |
| **Anticipated Responses/Outcomes:**   * Some groups may have trouble keeping track of values—encourage students to jot notes as they think. * Some students may easily find responses, but struggle to articulate how—scaffold language. | | | |
|  | **4. The Link**   * How did we solve this problem? * What do we know about variables? * Today you will use what you know about variables and the strategy we tried out together to solve similar problems in your packet. * Stop after #4, so we can come back together as a group. If you finish 2, 3, and 4, you can come to the rug and check your work with a friend so I’ll know you are ready to move on. | **(Workshop Time)**   * Students will use the strategy we employed on the rug—identifying pairs that work for one equation and using the process of eliminiation . | * Confer |
|  | **5. Closing (at the share)**   * Process share—what worked? What was challenging? * Extending the lesson—how does this help us as mathematicians? (We have more options for respresentation, we can problem solve, we know more about equivalence…) | * What are students going to share/ respond to? * How many students will share? * How will you determine who shares? | * How will you assess the application of the concept during the workshop time? * How will you communicate to the students what they accomplished today? |
| **Anticipated Responses/Outcomes:**   * I would like all students to complete 2-4 and most students to complete 5 | | | |

**Reflections:**

How did the lesson plan work? What was effective? What did you learn? What would you change for tomorrow or the next time you will use this plan?